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**WT—206—2024**

**FACULTY OF SCIENCE**

**M.Sc. (First Year) (Second Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2024**

**PHYSICS**

Paper (Ph-203)

(Numerical Techniques in Physics)

**(Monday, 16-12-2024)**

**Time : 10.00 a.m. to 1.00 p.m.**

*Time—3 Hours*

*Maximum Marks—75*

*N.B. :-* (i) Attempt *all* questions.

(ii) Each question carries equal marks.

(iii) Figures to the right indicate full marks.

1. (a) Write down general quadrature formula and derive Simpson's 3/8 rule  
from it. 7

(b) Solve by Gauss-elimination method 8

$$2x + y + 4z = 12, \quad 8x - 3y + 2z = 23, \quad 4x + 11y - z = 33$$

P.T.O.

Or

- (c) Describe Gauss-Jordan elimination method for the solution of simultaneous equations. 7
- (d) Evaluate the integral  $\int_0^1 \frac{1}{1+x} dx$  using Trapezoidal rule. 8
2. (a) Describe built in functions and user defined functions in C programming with one example each. 7

- (b) Find the inverse of matrix  $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$  by Gauss-Jordan method. 8

Or

- (c) Derive an expression for Newton-Cotes formula for numerical integration. 7
- (d) Find the highest eigen value and corresponding eigen vectors of the following matrix : 8

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

3. (a) Describe principle of least square fit method to fit the data into a straight line. 7

- (b) Fit a second degree parabola to the following data : 8

$x$	1.0	1.5	2.0	2.5	3.0	3.5	4.0
$y$	1.1	1.3	1.6	2.0	2.7	3.4	4.1

Or

- (c) Derive an expression for Newton's forward interpolation formula. 7

- (d) The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface : 8

$x = \text{height}$	100	150	200	250	300	350	400
$y = \text{distance}$	10.63	13.03	15.04	16.81	18.42	19.90	21.27

Find the value of  $y$  when  $x = 390$ .

4. (a) Discuss Bisection method to obtain roots of polynomial equation. 7
- (b) Find a real root of the equation  $x^3 - 2x - 5 = 0$  by the method of false position correct to three decimal places. 8

Or

- (c) Explain method of false position to obtain roots of polynomial equation. 7

- (d) Find a root of the equation  $x^3 - 4x - 9 = 0$ , using the bisection method correct to three decimal places. 8

P.T.O.

5. Write short notes on (any *three*): 15

- (1) Random Numbers
- (2) Executable and Non-executable statements in C-Programming
- (3) Milne's Predictor Corrector Method
- (4) Solution of Laplace's equation using finite difference method.